

LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA24 | Birmingham Interchange and Chelmsley Wood

Data appendix (AQ-001-024)

Air quality

November 2013

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Department for Transport

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Appendix AQ-001-024

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1 Introduction

1.1.1 The air quality appendices for the Birmingham Interchange and Chelmsley Wood community forum area (CFA24) comprise:

- discussion of the policy framework (Section 2);-
- baseline air quality data (Section 3);
- dust impact evaluation and risk rating (Section 4);
- air quality assessment - road traffic (Section 5); and
- air quality assessment - combustion plant (Section 6).

1.1.2 Maps referred to throughout the air quality appendix are contained in the Volume 5: air quality map book.

2 Policy framework

- 2.1.1 The Birmingham Interchange and Chelmsley Wood area lies within the administrative areas of Solihull Metropolitan Borough Council (SMBC) and North Warwickshire Borough Council (NWBC).
- 2.1.2 The Solihull Unitary Development Plan¹ (SUDP) sets policies to ensure that any new development contributes positively towards the council's environmental objectives. This includes considering the implications of new developments on air quality as part of policy ENV15.
- 2.1.3 The Solihull Draft Local Plan² (SDLP) sets out plans for all future development in the borough. Even though there is no policy specifically targeting air quality, the SDLP aims to provide better transport links, which will seek to improve and maintain air quality within SMBC. Policy P14 seeks to protect the amenity of areas by only permitting development that would not significantly conflict with any air quality standards.
- 2.1.4 The Core Strategy³ within the North Warwickshire Local Plan (NWLP) sets policies for all future development in the borough. Saved policy ENV9 specifically targets air quality and sets requirements for new development, such as not permitting potentially polluting forms of development within or near Air Quality Management Areas (AQMA's). Other saved policies indirectly linked to air quality comprise policy ENV3 on nature conservation and ENV11 on neighbour amenities.
- 2.1.5 Local and regional guidance relevant to the consideration of climate change adaptation and air quality is provided in the West Midlands Climate Change Adaptation Framework for Action⁴ and the Department for Environment, Food and Rural Affairs (Defra) technical report on health effects of climate change in the West Midlands⁵.

¹ Solihull Metropolitan Borough Council (2006), Solihull Unitary Development Plan.

² Solihull Metropolitan Borough Council (2012), Solihull Draft Local Plan: Shaping a Sustainable Future (Local Development Framework Pre-Submission Draft).

³ North Warwickshire Borough Council (2003), North Warwickshire Local Plan Core Strategy (Submission Version).

⁴ Transport Research Laboratory (2009), Climate Change Adaptation in the West Midlands: A Framework for Action.

⁵ Department for Environment, Food and Rural Affairs (Defra) (2010), Health Effects of Climate Change in the West Midlands: Technical Report.

3 Baseline air quality data

3.1 Existing air quality

Local authority review and assessment information

- 3.1.1 There are no AQMAs within the study area. Due to monitored concentrations being below the air quality standards over the past five years in SMBC, the council has not declared any AQMAs and consequently any Air Quality Action Plans (AQAPs)⁶. NWBC had declared an AQMA for annual mean NO₂ concentrations covering the area around junction 4 of the M6 and a dwelling to the north. However, due to concentrations reducing below the air quality standard for NO₂ over the past few years and the dwelling also being unoccupied, thus removing any relevant exposure, the AQMA was revoked in 2013⁷.

Local air quality monitoring data

- 3.1.2 Monitoring sites within the study area that are considered relevant for this assessment are shown in Map AQ-01-024 (Volume 5, Map Book Air quality). The following sections provide a summary of the recorded pollutant concentrations at these sites. There are no continuous monitoring sites within the study area.
- 3.1.3 The pollutant concentrations can be compared to the air quality standards:
- 40µg/m³ as an annual mean for NO₂ and PM₁₀;
 - 200µg/m³ one-hour mean for NO₂ not to be exceeded more than 18 times a year (equivalent to the 99.8th percentile of the one-hour mean); and
 - 50µg/m³ 24-hour mean for PM₁₀ not to be exceeded more than 35 times a year (equivalent to the 90.4th percentile of the 24-hour mean);

Diffusion tubes

- 3.1.4 This section summarises the results from the diffusion tube sites that are considered relevant for the assessment of air quality in this study area. It can be observed that monitored concentrations are close to or above the air quality standard close to major roads, such as the M6, but they fall well below the standard at locations further away from these roads.

Table 1: Annual mean NO₂ concentrations recorded at diffusion tube monitoring sites^{6,7}

Site	Ordnance Survey coordinates	Annual mean NO ₂ concentrations (µg/m ³)				
		2008	2009	2010	2011	2012
Blackfirs (suburban location)	419496, 285227	No data ⁸	No data	N/A ⁹	23	No data
M6 Coleshill (roadside location)	419964, 286625	53	47	49	58	70

6 Solihull Metropolitan Borough Council (2012), Air Quality Updating and Screening Assessment.

7 North Warwickshire Borough Council (2013), Air Quality Progress Report.

8 No monitoring undertaken at this location for this year.

9 Data not available due to low data capture (below 75%).

Site	Ordnance Survey coordinates	Annual mean NO ₂ concentrations (µg/m ³)				
		2008	2009	2010	2011	2012
Partridge Close (roadside location)	418710, 287420	No data	No data	N/A	29	No data
Old Station Road (roadside location)	419860, 282921	No data	No data	N/A	40	No data
AQMA Farmhouse (gate) (roadside location)	419932, 286835	44	34	39	33	38
AQMA Farmhouse (fence) (roadside location)	419948, 286822	36	42	38	34	37

Background pollutant concentrations

- 3.1.5 Estimates of background air quality have been taken from the Defra maps¹⁰. Background concentrations are below the air quality standards for all pollutants across the route of the Proposed Scheme. Annual mean NO₂ concentrations range from 24.1-39.1µg/m³, with increased concentrations near the M₄2/M₆ junction. Annual mean PM₁₀ concentrations range from 18.3-20.4µg/m³, while annual mean PM_{2.5} concentrations are significantly lower ranging from 12.5-14.3µg/m³.
- 3.1.6 Future background pollutant concentrations have also been taken from the Defra maps for 2017 and 2026 to inform the construction and operational traffic assessments. Concentrations are anticipated to reduce for all pollutants in the future assessment years as a result of continuing reductions in emissions from motor vehicles.

Local emission sources

- 3.1.7 The main source of air pollution within the study area is road vehicles, since the road component is the largest contribution in the NO_x background maps. Major roads include the A₄₅ Coventry Road towards the south of the study area, the M₄2 and A₄₅2 Chester Road running through the study area and the A₄₄6 Stonebridge Road and M₆ in the northern section. Other emission sources in the area include industrial processes regulated by the Environment Agency (part A processes) and the local authority (part B processes). There is only one such process with emissions to air, which is a waste landfill site towards the east of the study area, but due to the nature of its emissions it is unlikely that this will have an effect on local air quality in the study area.

¹⁰ Department for Environment, Food and Rural Affairs; 2010 based background maps for NO_x, NO₂, PM₁₀ and PM_{2.5}; <http://laqm.defra.gov.uk/maps/maps2010.html>; Accessed: July 2013.

3.2 Receptors

Human

Construction phase

- 3.2.1 There are few human receptors in the study area that are close to dust-generating activities and/or traffic routes used during construction of the Proposed Scheme. As a worst case, the receptors closest to these activities have been included in the assessment as representatives of the conditions in each area. For the construction dust assessment, these receptors are: 217 Old Station Road; properties along Middle Bickenhill Lane; Park Farm; Common Farm and properties along Yorkminster Drive in Chelmsley Wood. For the construction traffic assessment, the assessed receptors are: 217 Old Station Road, Myrtle Cottage Farm, Park Farm, Common Farm and properties along Coleshill Heath Road.

Operational phase

- 3.2.2 Similar to the construction phase, human receptors during operation of the Proposed Scheme have been selected due to their proximity to affected roads. As a worst case the receptors closest to the road have been included in the assessment as representatives of the conditions in each area. These receptors are: Bickenhill Stores Cottage, 11 Coventry Road, Elmdon Hall Lodge, Longacre Farm, 217 Old Station Road, Myrtle Cottage Farm, Park Farm, Common Farm and properties along Drake Croft in Chelmsley Wood.

Ecological

Construction phase

- 3.2.3 There is only one ecological receptor within the study area which is sensitive to dust and nitrogen deposition: the Coleshill and Bannerly Pools Site of Special Scientific Interest (SSSI) located near junction 4 of the M6. The southern edge of the site runs parallel to the M42 and is close to dust-generating activities, while both the M42 and M6 will be roads used during construction of the Proposed Scheme. Unit 1 of the SSSI (located between the A446 Stonebridge Road and the M42) has been designated for habitats of fen, marsh and swamp, while unit 2 (located south of the M6) has been designated for broadleaved, mixed and yew woodland¹¹. Further details on this ecological receptor can be found in Volume 5: Appendix EC-007-254.

Operational phase

- 3.2.4 Due to the proximity of the M42 and the M6 to the Coleshill and Bannerly Pools SSSI, this ecological receptor is included in the assessment for the operation of the Proposed Scheme.

¹¹ Natural England; Sites of Special Scientific Interest; http://www.sssi.naturalengland.org.uk/special/sssi/sssi_details.cfm?sssi_id=1001216; Accessed: 20 August 2013.

4 Dust impact evaluation and risk rating

4.1.1 The following sections provide details of the assessment of construction impacts following the Institute of Air Quality Management (IAQM) guidance¹². Where considered useful to identify receptors and their relationship to the construction activity, a specific figure is provided.

Table 2: Evaluation and risk rating of construction activities

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with CoCP mitigation measures)	Principal justifications
217 Old Station Road (see Map CT-05-106-L1, J5, Volume 2, CFA24 Map Book)						
Demolition	N/A ¹³	N/A	N/A	N/A	N/A	No demolition activities in this area.
Earthworks	< 20m	Small	Medium	Low	Negligible	Widening of A45 Coventry Road /M42 junction 6 roundabout and associated earthwork embankments. One residential property within 20m of activities. Local PM ₁₀ concentrations 19µg/m ³ .
Construction	N/A	N/A	N/A	N/A	N/A	No construction activities in this area.
Trackout	N/A	N/A	N/A	N/A	N/A	No trackout activities in this area.
Middle Bickenhill Lane (see Map AQ-02-24-01, Figures 24.1 and 24.2, Volume 5, Map Book Air quality)						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition activities in this area.
Earthworks	20 - 50m	Large	High	Medium	Negligible	Areas of topsoil / temporary storage and temporary earthworks stockpiles. Assumption of site area more than 10,000m ² . Less than 10 residential properties within 50m of activities.

¹² Institute of Air Quality Management (IAQM) (2011), Guidance on the assessment of the impacts of construction on air quality and the determination of their significance.

¹³ Type of activity not undertaken within 350m of assessed receptor.

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with CoCP mitigation measures)	Principal justifications
						Local PM ₁₀ concentrations 19µg/m ³ .
Construction	50 - 100m	Small	Low	Medium	Negligible	Construction of multi-storey temporary workers accommodation. Less than 10 residential properties within 100m of activities. Local PM ₁₀ concentrations 19µg/m ³ .
Trackout	20 - 50m	Small	Low	Medium	Negligible	Daily trips of 10 Heavy Duty Vehicles (HDVs) along Middle Bickenhill Lane. Less than 10 residential properties within 50m of activities.
Park Farm (see Map AQ-02-24-01, Figure 24.3, Volume 5, Map Book Air quality)						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition activities in this area.
Earthworks	50 - 100m	Large	Medium	Low	Negligible	Creation of new access road and car parking for the Interchange station and widening of the existing A452 Chester Road. One residential property within 100m of activities. Local PM ₁₀ concentrations 18µg/m ³ .
Construction	100 - 200m	Large	Medium	Low	Negligible	Construction of Birmingham Interchange station main compound and car park (east) satellite compound. One residential property within 200m of activities. Local PM ₁₀ concentrations 18µg/m ³ .
Trackout	N/A	N/A	N/A	N/A	N/A	No trackout activities in this area.
Common Farm (see Map AQ-02-24-01, Figure 24.4, Volume 5, Map Book Air quality)						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition activities in this area.
Earthworks	20 - 50m	Large	High	Low	Negligible	Widening of the A452 Chester Road, removal

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with CoCP mitigation measures)	Principal justifications
						of the existing A452 Chester Road roundabout and creation of new roundabout with associated access roads and non-engineering earthworks. One residential property within 50m of activities. Local PM ₁₀ concentrations 18µg/m ³ .
Construction	100 - 200m	Small	Negligible	Low	Negligible	Construction of satellite compound.
Trackout	N/A	N/A	N/A	N/A	N/A	No trackout activities in this area.
Yorkminster Drive (see Map CT-05-107, D10, Volume 2, CFA24 Map Book)						
Demolition	N/A	N/A	N/A	N/A	N/A	No demolition activities in this area.
Earthworks	100 - 200m	Large	Medium	Medium	Negligible	Pool Wood embankment, average height 7.4m. Densely populated area more than 100m away from activities. Local PM ₁₀ concentrations 19µg/m ³ .
Construction	N/A	N/A	N/A	N/A	N/A	No construction activities in this area.
Trackout	N/A	N/A	N/A	N/A	N/A	No trackout activities in this area.
Coleshill and Bannerly Pools SSSI (see Map EC-01-054a, Volume 5, Map Book Ecology and Map CT-05-107-R1, H4, Volume 2, CFA24 Map Book)						
Demolition	40 - 100m	Small	Negligible	High	Negligible	Removal of existing A452 Chester Road roundabout and associated piles and pile caps. Statutory designated site at national level.
Earthworks	40 - 100m	Large	Low	High	Negligible	Removal of existing A452 Chester Road roundabout and engineering earthworks. Statutory designated site at national level.
Construction	N/A	N/A	N/A	N/A	N/A	No construction activities in this area.

Activity	Distance to nearest receptor	Dust emission class	Dust risk category	Sensitivity of surrounding area	Magnitude of impact (with CoCP mitigation measures)	Principal justifications
Trackout	N/A	N/A	N/A	N/A	N/A	No trackout activities in this area.

Table 3: Summary of construction dust impacts and effects

Location	Magnitude of impact	Effect of dust-generating activities	Additional mitigation ¹⁴
217 Old Station Road	Negligible	Not significant	None required
Middle Bickenhill Lane	Negligible	Not significant	None required
Park Farm	Negligible	Not significant	None required
Common Farm	Negligible	Not significant	None required
Yorkminster Drive	Negligible	Not significant	None required
Coleshill and Bannerly Pools SSSI	Negligible	Not significant	None required

¹⁴ Planned mitigation measures are detailed in the draft CoCP (Volume 5: Appendix CT-003-000/1).

5 Air quality assessment - road traffic

5.1 Overall assessment approach

- 5.1.1 The air quality assessment for road related emissions has used three different approaches based on the scale of changes in traffic and road alignment. Where the Design Manual for Roads and Bridges¹⁵ (DMRB) thresholds detailed in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1) will not be exceeded, any additional assessment is not required as the air quality impacts will be minimal. If these thresholds are breached, then a quantitative assessment has been carried out.
- 5.1.2 If it is considered unlikely that air quality standards will be exceeded and the road configuration is a simple one, then the DMRB screening method has been used to predict changes in air quality. Where there will be a risk of standards being exceeded, where the road layout is considered to be complex or where the use of the DMRB screening method has indicated that there will be a potential exceedance of air quality standards, then the atmospheric dispersion model ADMS-Roads has been used for the assessment. Professional judgment has been used to select the appropriate tool for each area.
- 5.1.3 In this study area the DMRB screening method was considered to be a suitable tool for the assessment due to the rural nature of the area and the reduced number of receptors close to roads used during construction and operation of the Proposed Scheme.
- 5.1.4 An assessment of nitrogen deposition and NO_x concentrations was also undertaken at the Coleshill and Bannerly Pools SSSI due to changes in operational traffic flows. Information for the critical load and average nitrogen deposition for the main habitats within the SSSI were taken from the Air Pollution Information System website¹⁶. The SSSI is split into three units according to variations in their habitats, but only units 1 and 2 are close to roads affected by construction/operational flows.
- 5.1.5 The main habitat for unit 1 (between the M42 and A446 Stonebridge Road) is fen, marsh and swamp, with a critical load of 10 - 15kg N/ha/year and an average baseline nitrogen deposition rate of 21 kg N/ha/year in 2011. The main habitat for unit 1 (south of the M6) is broadleaved, mixed and yew woodland with an empirical critical load of 5 - 15kg N/ha/year and an average baseline nitrogen deposition rate of 39 kg N/ha/year in 2011. It can be observed that existing nitrogen deposition rates currently exceed the critical load for both units even without the construction/operation of the Proposed Scheme.
- 5.1.6 Future deposition rates for these units were calculated assuming a 2% reduction per year as per the DMRB methodology. The predicted nitrogen deposition rate and NO_x concentrations were calculated for the future construction (2017) and operation (2026) years with and without the Proposed Scheme. The predicted changes were then compared to the 1% value of the standard as per the DMRB methodology.

¹⁵ Highways Agency (2007), The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07).

¹⁶ Air Pollution Information System; Site relevant critical loads and source attribution; <http://www.apis.ac.uk/src/>; Accessed August 2013.

5.2 Construction traffic model

5.2.1 Construction traffic data used in this assessment are detailed in Volume 5: Appendix TR-001-000. Scenarios assessed were without the Proposed Scheme and with the Proposed Scheme (months 30, 35, 44, 44a and 65 of the construction period).

Receptors assessed

5.2.2 For all road links where the DMRB criteria for local air quality were met, a number of receptors representative of worst-case exposure locations were selected for the assessment. These included locations representative of highest concentrations along the roads, including closest to junctions or to the road itself. The assessed receptors are listed in Table 4 and shown on Map AQ-01-024 (Volume 5, Map Book Air quality).

Table 4: Modelled receptors (construction phase)

Receptor	Description/Location	Ordnance Survey coordinates	Scenarios assessed with the Proposed Scheme
R24-1	217 Old Station Road	419819, 282850	Months 35 and 44a
R24-3	Myrtle Cottage Farm	420249, 283171	Months 30 and 35
R24-4	Park Farm	420654, 284044	Month 30
R24-5	Common Farm	420030, 284929	Months 30 and 35
R24-6	100 Coleshill Heath Road	418910, 286366	Month 65
R24-E1	Coleshill and Bannerly Pools SSSI (Unit 1)	419762, 286298	Month 44a
R24-E2	Coleshill and Bannerly Pools SSSI (Unit 2)	420031, 286455	Month 30

Background concentrations

5.2.3 The background concentrations used in the assessment are shown in Table 5 taken from the Defra maps.

Table 5: Background 2017 concentrations at assessed receptors

Receptor	Concentrations ($\mu\text{g}/\text{m}^3$)		
	NO _x	NO ₂	PM ₁₀
(R24-1) 217 Old Station Road	33.6	22.3	17.8
(R24-3) Myrtle Cottage Farm	28.4	19.3	17.9
(R24-4) Park Farm	32.1	21.4	17.2
(R24-5) Common Farm	32.1	21.4	17.2
(R24-6) 100 Coleshill Heath Road	31.7	21.2	15.8
(R24-E1) Coleshill and Bannerly Pools SSSI (Unit 1)	48.8	30.4	N/A ¹⁷
(R24-E2) Coleshill and Bannerly Pools SSSI (Unit 2)	39.2	25.4	N/A

¹⁷ Not relevant for the assessment of nitrogen deposition and NO_x concentrations.

DMRB model results

5.2.4 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the Environmental Protection UK (EPUK) methodology¹⁸.

Table 6: Summary of DMRB annual mean NO₂ results (construction phase)

Receptor	Concentrations (µg/m ³)			Change in concentrations (µg/m ³)	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
(R24-1) 217 Old Station Road	40.1	33.0	33.6	0.6	Small	Negligible
(R24-3) Myrtle Cottage Farm	29.8	24.6	25.2	0.6	Small	Negligible
(R24-4) Park Farm	33.1	27.5	27.8	0.3	Imperceptible	Negligible
(R24-5) Common Farm	34.4	28.8	29.2	0.4	Small	Negligible
(R24-6) 100 Coleshill Heath Road	34.8	29.2	29.5	0.3	Imperceptible	Negligible

Table 7: Summary of DMRB annual mean PM₁₀ results (construction phase)

Receptor	Concentrations (µg/m ³)			Change in concentrations (µg/m ³)	Magnitude of change	Impact descriptor
	2012 baseline	2017 without Proposed Scheme	2017 with Proposed Scheme			
(R24-1) 217 Old Station Road	22.4	20.8	20.9	0.1	Imperceptible	Negligible
(R24-3) Myrtle Cottage Farm	20.1	19.1	19.2	0.1	Imperceptible	Negligible
(R24-4) Park Farm	20.3	19.0	19.1	0.1	Imperceptible	Negligible
(R24-5) Common Farm	20.7	19.4	19.5	0.1	Imperceptible	Negligible
(R24-6) 100 Coleshill Heath Road	18.7	17.4	17.5	0.1	Imperceptible	Negligible

¹⁸ Environmental Protection UK (EPUK) (2010), Development Control: Planning for Air Quality.

Table 8: Results of ecological assessment (construction phase)

Receptor	Nitrogen deposition rate (kg N/ha/year)					NOx concentrations (µg/m³)				
	Critical load	1% of lower critical load	2017 without Proposed Scheme	2017 with Proposed Scheme	Change	Air quality standard	1% of air quality standard	2017 without Proposed Scheme	2017 with Proposed Scheme	Change
(R24-E1) Coleshill and Bannerly Pools SSSI (Unit 1)	10 - 15	0.10	16.2	16.2	0.009	30	0.3	68.5	68.8	0.3
(R24-E2) Coleshill and Bannerly Pools SSSI (Unit 2)	5 - 15	0.05	32.6	32.6	0.013	30	0.3	58.8	59.3	0.5

- 5.2.5 It can be observed that both the annual mean NO₂ and PM₁₀ concentrations are forecast to be within the air quality standards with and without construction of the Proposed Scheme. Since the annual mean NO₂ concentrations are predicted to be well below 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM₁₀ concentrations are predicted to be below 35µg/m³, the daily mean standard is also expected to be met.
- 5.2.6 Changes in modelled concentrations with and without the Proposed Scheme have been calculated to determine the impact to local air quality. The change in NO₂ concentrations is small at three receptors and imperceptible at the other receptors. The change in PM₁₀ concentrations is imperceptible at all receptors. As such, only negligible impacts are expected at all receptors in relation to NO₂ and PM₁₀ concentrations.
- 5.2.7 From the ecological assessment it can be observed that the predicted change in nitrogen deposition with and without the Proposed Scheme is well below 1% of the lower critical load for both units of the SSSI. As such, the impact of the Proposed Scheme to the SSSI will be negligible and the effect not significant.

Assessment of significance

- 5.2.8 Considering the significance of the air quality impacts according to the criteria set in the EPUK methodology, the following points are noted:
- the overall magnitude of impact is negligible for both NO₂ and PM₁₀ concentrations;
 - pollutant concentrations remain below the air quality standards for both NO₂ and PM₁₀ with and without the Proposed Scheme; and
 - there are no AQMAs within the study area.
- 5.2.9 Based on the above, air quality effects from construction of the Proposed Scheme will not be significant.

5.3 Operational traffic model

- 5.3.1 Operational traffic data used in this assessment are detailed in Volume 5: Appendix TR-001-000. Scenarios assessed were without and with the Proposed Scheme for the year 2026.

Receptors assessed

- 5.3.2 For all road links where the DMRB criteria for local air quality were met, a number of receptors representative of worst-case exposure locations were selected for the assessment. These included locations representative of highest concentrations along the roads, including closest to junctions or to the road itself. The assessed receptors are listed in Table 9 and shown on Map AQ-01-024 (Volume 5, Map Book Air quality).

Table 9: Modelled receptors (operational phase)

Receptor	Description/Location	Ordnance Survey coordinates
R24-1	217 Old Station Road	419819, 282850
R24-3	Myrtle Cottage Farm	420249, 283171
R24-4	Park Farm	420654, 284044
R24-5	Common Farm	420030, 284929
R24-7	Bickenhill Stores Cottage	418427, 282910
R24-8	11 Coventry Road	417248, 283128
R24-9	Elmdon Hall Lodge	416813, 283256
R24-10	Longacre Farm	419266, 283057
R24-11	3 Drake Croft	418640, 287531
R24-E1	Coleshill and Bannerly Pools SSSI (Unit 1)	419762, 286298
R24-E2	Coleshill and Bannerly Pools SSSI (Unit 2)	420031, 286455

Background concentrations

5.3.3 The background concentrations used in the assessment are shown in Table 10 taken from the Defra maps.

Table 10: Background 2026 concentrations at assessed receptors

Receptor (or zone of receptors)	Concentrations (µg/m ³)		
	NO _x	NO ₂	PM ₁₀
(R24-1) 217 Old Station Road	23.5	16.5	17.0
(R24-3) Myrtle Cottage Farm	20.5	14.6	17.5
(R24-4) Park Farm	23.3	16.3	16.5
(R24-5) Common Farm	23.3	16.3	16.5
(R24-7) Bickenhill Stores Cottage	23.4	16.4	15.9
(R24-8) 11 Coventry Road	30.9	20.5	15.2
(R24-9) Elmdon Hall Lodge	32.6	21.4	15.4
(R24-10) Longacre Farm	25.7	17.8	16.6
(R24-11) 3 Drake Croft	25.2	17.5	16.8
(R24-E1) Coleshill and Bannerly Pools SSSI (Unit 1)	32.9	21.9	N/A ¹⁹
(R24-E2) Coleshill and Bannerly Pools SSSI (Unit 2)	26.7	18.4	N/A

¹⁹ Not relevant for the assessment of nitrogen deposition and NO_x concentrations.

DMRB model results

5.3.4 This section provides the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the Environmental Protection UK (EPUK) methodology¹⁸.

Table 11: Summary of DMRB annual mean NO₂ results (construction phase)

Receptor	Concentrations (µg/m ³)		Change in concentrations (µg/m ³)	Magnitude of change	Impact descriptor
	2017 without Proposed Scheme	2017 with Proposed Scheme			
(R24-1) 217 Old Station Road	27.0	27.0	0.0	Imperceptible	Negligible
(R24-3) Myrtle Cottage Farm	19.6	19.6	0.0	Imperceptible	Negligible
(R24-4) Park Farm	22.0	28.0	6.0	Large	Slight adverse
(R24-5) Common Farm	21.6	20.4	-1.2	Small	Negligible
(R24-7) Bickenhill Stores Cottage	25.6	25.6	0.0	Imperceptible	Negligible
(R24-8) 11 Coventry Road	27.5	27.5	0.0	Imperceptible	Negligible
(R24-9) Elmdon Hall Lodge	27.9	27.9	0.0	Imperceptible	Negligible
(R24-10) Longacre Farm	21.9	21.9	0.0	Imperceptible	Negligible
(R24-11) 3 Drake Croft	21.8	21.8	0.0	Imperceptible	Negligible

Table 12: Summary of DMRB annual mean PM₁₀ results (construction phase)

Receptor	Concentrations (µg/m ³)		Change in concentrations (µg/m ³)	Magnitude of change	Impact descriptor
	2017 without Proposed Scheme	2017 with Proposed Scheme			
(R24-1) 217 Old Station Road	20.5	20.6	0.1	Imperceptible	Negligible
(R24-2) Mill Farm	16.5	16.5	0.0	Imperceptible	Negligible
(R24-3) Myrtle Cottage Farm	18.7	18.7	0.0	Imperceptible	Negligible
(R24-4) Park Farm	18.4	20.6	2.2	Medium	Negligible

Receptor	Concentrations ($\mu\text{g}/\text{m}^3$)		Change in concentrations ($\mu\text{g}/\text{m}^3$)	Magnitude of change	Impact descriptor
	2017 without Proposed Scheme	2017 with Proposed Scheme			
(R24-5) Common Farm	18.2	17.9	-0.3	Imperceptible	Negligible
(R24-7) Bickenhill Stores Cottage	18.8	18.9	0.1	Imperceptible	Negligible
(R24-8) 11 Coventry Road	16.6	16.6	0.0	Imperceptible	Negligible
(R24-9) Elmdon Hall Lodge	16.8	16.8	0.0	Imperceptible	Negligible
(R24-10) Longacre Farm	17.5	17.5	0.0	Imperceptible	Negligible
(R24-11) 3 Drake Croft	18.2	18.2	0.0	Imperceptible	Negligible

Table 13: Results of ecological assessment (operational phase)

Receptor	Nitrogen deposition rate ($\text{kg N}/\text{ha}/\text{year}$)					NOx concentrations ($\mu\text{g}/\text{m}^3$)				
	Critical load	1% of lower critical load	2026 without Proposed Scheme	2026 with Proposed Scheme	Change	Air quality standard	1% of air quality standard	2026 without Proposed Scheme	2026 with Proposed Scheme	Change
(R24-E1) Coleshill and Bannerly Pools SSSI (Unit 1)	10 - 15	0.10	13.9	13.9	0.0	30	0.3	52.1	52.1	0.0
(R24-E2) Coleshill and Bannerly Pools SSSI (Unit 2)	5 - 15	0.05	27.6	27.6	0.004	30	0.3	45.8	45.9	0.1

- 5.3.5 It can be observed that both the annual mean NO₂ and PM₁₀ concentrations are forecast to be well below the air quality standards with and without operation of the Proposed Scheme. Since the annual mean NO₂ concentrations are predicted to be well below 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM₁₀ concentrations are predicted to be below 35µg/m³, the daily mean standard is also expected to be met.
- 5.3.6 Changes in modelled concentrations with and without the Proposed Scheme have been calculated to determine the impact to local air quality. The change in NO₂ concentrations is large at Park Farm and small at Common Farm, while imperceptible changes are predicted for all other receptors. The change in PM₁₀ concentrations is medium at Park Farm and imperceptible at all other receptors. As such, a slight adverse impact is expected at Park Farm and negligible at all other receptors in relation to NO₂ concentrations, while a negligible impact is expected at all receptors in relation to PM₁₀ concentrations.
- 5.3.7 From the ecological assessment it can be observed that the predicted change in nitrogen deposition with and without the Proposed Scheme is well below 1% of the lower critical load for both units of the SSSI. As such, the impact of the Proposed Scheme to the SSSI will be negligible and the effect not significant.

Assessment of significance

- 5.3.8 Considering the significance of the air quality impacts according to the criteria set in the EPUK methodology, the following points are noted:
- the overall magnitude of impact is slight adverse at worst for NO₂ and negligible for PM₁₀ concentrations;
 - pollutant concentrations remain well below the air quality standards for both NO₂ and PM₁₀ with and without the Proposed Scheme; and
 - there are no AQMAs within the study area.
- 5.3.9 Based on the above, air quality effects from the operation of the Proposed Scheme will not be significant.

6 Air quality assessment - combustion plant

6.1 Introduction

- 6.1.1 The Birmingham Interchange station will include a combustion plant to accommodate the heating demand of the buildings. An assessment of its associated emissions has been undertaken following the methodology detailed in the SMR Addendum (Volume 5: Appendix CT-001-000/2). An initial screening was carried out to determine whether these boilers would be controlled by the Clean Air Act²⁰. A further assessment for the required stack height was undertaken following the D1 methodology²¹, an approach developed by the (former) Her Majesty's Inspectorate of Pollution.
- 6.1.2 The Clean Air Act sets provisions for stationary combustion plants and applies to furnaces burning any liquid or gaseous matter at a rate equivalent to or more than 366.4kW. The D1 methodology is used to determine the appropriate height of release of emissions from discharge stacks so that effects are unlikely to be significant at receptors. This methodology is based on instantaneous emissions and was designed to consider short-term peak concentrations, rather than the annual average considered by the Clean Air Act screening.
- 6.1.3 The combustion plant at the Birmingham Interchange station will operate natural gas fired boilers with a proposed total thermal input of 3MW and associated emissions to air of NO₂ and therefore will be controlled by the Clean Air Act.

6.2 D1 assessment

- 6.2.1 The D1 assessment has been carried out using an average building height of 10m and two different scenarios for total thermal input of the boilers; 2MW (scenario A) as a minimum and 5MW (scenario B) as a worst case. The emissions characteristics for these scenarios were taken from the SMR Addendum (Volume 5: Appendix CT-001-000/2). These data are the characteristics for short term operation and provide a conservative basis for the assessment scenarios for the combustion plant. The actual combustion plant will comply with all relevant guidance and emissions standards and is likely to have smaller impacts than this worst case assessment.
- 6.2.2 Background concentrations were taken from the Defra background maps for the future year 2026 and multiplied by a factor of 2.5 as set out in the D1 methodology. The input parameters used in the D1 assessment for the two scenarios (2MW and 5MW) are set out in Table 14.

Table 14: D1 assessment input parameters

Input parameter	Scenario A	Scenario B
Total thermal input	2MW	5MW

²⁰ Clean Air Act 1993 (c.11). London, Her Majesty's Stationery Office

²¹ Her Majesty's Inspectorate of Pollution (1993), Technical Guidance Note (Dispersion) D1: Guidelines on Discharge Stack Heights for Polluting Emissions. London, Her Majesty's Stationery Office

Input parameter	Scenario A	Scenario B
Total flow (actual)	0.87 m ³ /s	2.98 m ³ /s
Stack/Flue diameter	0.33 m	0.62 m
Exit velocity	10 m/s	10 m/s
Discharge temperature	69 °C	179 °C
Building height	10 m	10 m
NO ₂ emissions rate	0.044 g/s	0.111 g/s
Background NO ₂ concentrations	0.036 mg/m ³	0.036 mg/m ³

6.2.3 The results of the D1 assessment were a release height of 12m for scenario A (2MW) and a release height of 13m for scenario B (5MW). The proposed stack height at Birmingham Interchange station is 3m above the roof level (at 10m), thus both scenarios meet the stack height requirements.

6.2.4 The D1 methodology also sets the following considerations:

- the minimum discharge velocity for a stationary source of this magnitude is 10m/s to avoid emissions flowing down the outside of the stack;
- no discharge stack should be less than 3m above the ground or any adjacent areas to which there is general access; for example, roof areas and elevated walkways; and
- a discharge stack should be at least 3m above any opening windows or ventilation air inlets.

6.2.5 The proposed combustion plant at the Birmingham Interchange station meets all these requirements and therefore impacts to local air quality are expected to be negligible.

6.3 Assessment of significance

6.3.1 Considering the significance of the air quality impacts, the following points are noted:

- the impacts to local air quality from the emissions of the combustion plant are expected to be negligible;
- the emissions from the discharge stack will be located at a height of at least 3m above the roof of the building;
- background pollutant concentrations in the area surrounding the Birmingham Interchange station are well below the air quality standard for NO₂ concentrations;
- there are very few receptors in the surrounding area; and
- there are no AQMAs within the study area.

6.3.2 Based on the above, air quality effects from the operation of the combustion plant in Birmingham Interchange station will not be significant.

7 References

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